

WHAT IS CLAIMED IS:

1. A motor comprising:

a magnet which has a cylindrical shape and is divided into N in the circumferential direction so as to be magnetized to different poles alternately;

5 a rotor shaft which is formed of a soft magnetic material and is fixed in the inside diameter portion of said magnet;

a first coil which is arranged adjacently to said magnet in the axial direction of said rotor shaft;

15 a first outside magnetic pole portion which is excited by said first coil, is inserted on the inner periphery side of said first coil, and is arranged so as to be opposed to a predetermined angle range of the outer peripheral surface of said magnet with a predetermined gap being provided between said first outside magnetic pole portion and the outer peripheral surface of said magnet;

20 a second coil which is arranged on almost the same plane as said first coil so as to be adjacent to said magnet in the axial direction of said rotor shaft; and

25 a second outside magnetic pole portion which is excited by said second coil, is inserted on the inner periphery side of said second coil, and is arranged so as to be opposed to a predetermined angle range of

the outer peripheral surface of said magnet with a predetermined gap being provided between said second outside magnetic pole portion and the outer peripheral surface of said magnet in a state in which the phase shifts through  $(180/N)$  degree with respect to the magnetization portion of said magnet from said first outside magnetic pole portion.

2. The motor according to claim 1, wherein said first outside magnetic pole portion and said second outside magnetic pole portion are formed of a same member.

3. The motor according to claim 1, wherein said first outside magnetic pole portion and said second outside magnetic pole portion are formed into a comb teeth shape extending in the axial direction of said rotor shaft and in the same direction.

4. The motor according to claim 1, wherein the excitation of said first coil and said second coil is switched at different timing.

5. The motor according to claim 1, wherein an angle  $\theta$  between said first outside magnetic pole portion and said second outside magnetic pole portion with the rotation center of said rotor shaft being the reference is  $\theta = (180 - 180/N)$  degree.